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TESTICULAR DEVELOPMENT AND ONSET OF PUBERTY IN BEEF BULLS

Donald D. Lunstra¹

Introduction

Selection and management of young beef bulls have been hampered by a lack of information on reproductive development, growth, and puberty. The use of an increasing number of sire breeds in the beef cattle industry has placed additional emphasis on the importance of defining differences in sexual maturation within and among breeds. We conducted the following studies as part of a program designed to characterize reproductive development and puberty in breeds of beef bulls.

Pubertal Traits in Beef Bulls. We studied pubertal development in Hereford, Angus, Red Poll, Brown Swiss, Hereford-Angus crossbred (HxA), and Angus-Hereford crossbred (AxH) bulls from 7 through 13 months of age. Pubertal factors characterized included body weight, testicular size, sperm produced, and sexual aggressiveness. Each trait was measured every 2 weeks from December through June. Puberty was defined as the age at which a bull first produced an ejaculate containing at least 50 million sperm with a minimum of 10 percent motility. Brown Swiss (264 days) and Red Poll (283 days) bulls reached puberty

earliest, Angus bulls (295 days) and crossbred bulls (AxH, 296; HxA, 300 days) were intermediate, and Hereford bulls (326 days) were latest to reach puberty (Table 1). Brown Swiss bulls were heaviest (649 lb), while Red Poll (568 lb) and Hereford (574 lb) bulls were lightest in body weight at puberty.

Although rather large differences in age and body weight at puberty existed among breeds of bulls, scrotal circumference at puberty among and within breeds did not differ ($P > .10$) and averaged 11.0 ± 0.1 in at puberty in all bulls (Table 1). The range of scrotal circumference at puberty was 10.2 to 11.8 in, and 52% of the bulls reached puberty at ≤ 11.0 in, 74% at ≤ 11.5 in, and 100% at ≤ 12.0 in. Scrotal circumference is an accurate measurement of testicular size and is easily obtained. We concluded that scrotal circumference may be a useful tool for selecting early maturing beef bulls with minimal effort. However, the effects of different nutritional planes and management practices on pubertal and testicular development remain to be investigated.

Breed Differences in Testis Size of Yearling Bulls. Scrotal circumference was measured in yearling Angus, Hereford, Gelbvieh, Brown Swiss, Red Poll, Simmental, Charolais, and Limousin bulls and compared to data collected in previous studies on pubertal age of heifers. Pubertal age in heifers was defined as

age at first standing heat (first estrus). Testis size (Table 2), measured as scrotal circumference, was largest in yearling bulls of breeds in which heifers reached puberty the earliest (Gelbvieh, Brown Swiss, and Red Poll), intermediate among breeds in which heifers reached puberty at intermediate ages (Angus and Simmental), and smallest among breeds in which heifers reached puberty the latest (Hereford, Charolais, and Limousin). The correlation between heifer pubertal age and yearling bull scrotal circumferences was 0.98 among breed means. Yearling scrotal circumference was affected significantly by breed, sire, age of dam, and body weight of bulls. Scrotal circumference and body weight was smaller in bulls from 2-year-old dams than from older dams. Adjustment of scrotal circumference for yearling body weight essentially nullified the effect of age of dam but increased the heritability estimate for scrotal circumference from 0.52 to 0.69, and significant effects of breed and sire remained. A large range in yearling scrotal circumference existed within each breed (Table 2). Based on the relatively high heritability of testis size, the relationship between testis size and age at puberty, and the range of testis size present within breed, selection of bulls for larger yearling testis size may provide a means for rapid improvement in pubertal age within breeds of beef cattle.

¹Donald D. Lunstra is a research physiologist at MARC.

Table 1.—Pubertal characteristics of various breeds of beef bulls¹

Pubertal trait	Breed group						All bulls ²
	Hereford	Angus	H x A crossbred	A x H crossbred	Red Poll	Brown Swiss	
Number of bulls evaluated	5	5	6	5	5	5	31
Age in days at:							
First sperm	266	265	258	268	252	236	258 ± 2
50 million sperm ³	326	295	300	296	283	264	294 ± 4
First completed mating	371	354	366	341	333	250	336 ± 5
Body weight in pounds at:							
First sperm	491	543	535	535	513	598	535 ± 9
50 million sperm ³	574	601	614	581	568	649	601 ± 9
First completed mating	625	708	730	669	645	623	671 ± 13
Scrotal circumference (inches) at:							
First sperm	9.4	10.8	9.8	10.5	10.1	10.3	10.2 ± .2
50 million sperm ³	11.0	11.3	10.9	11.2	10.8	10.9	11.0 ± .1
First completed mating	11.5	12.2	12.0	12.0	11.6	10.7	11.7 ± .1

¹Least-squares means.

²Data given as mean ± SEM.

³Based on first production of an ejaculate containing at least 50 million sperm with a minimum of 10 percent motility.

Table 2.—Breed comparisons: bull testicular size *versus* heifer age at puberty

Breed	Heifer age at puberty (days) ¹	Scrotal circumference of yearling bulls ²	
		Average (inches) ³	Range (inches)
Gelbvieh	341 ± 9 (81)	13.7 ± 0.2 (22)	11.9-16.6
Brown Swiss	347 ± 8 (126)	13.5 ± .2 (19)	12.2-15.6
Red Poll	352 ± 8 (95)	13.2 ± .2 (20)	11.7-14.6
Angus	372 ± 10 (24)	12.9 ± .2 (79)	10.3-15.1
Simmental	372 ± 6 (157)	12.9 ± .3 (28)	10.3-15.4
Hereford	390 ± 13 (27)	12.1 ± .2 (55)	10.3-14.2
Charolais	398 ± 7 (132)	12.0 ± .3 (31)	10.0-14.8
Limousin	398 ± 6 (161)	11.9 ± .2 (20)	9.6-13.5
Average	368 ± 3 (723)	12.7 ± .1 (274)	
Heritability41	.52	

¹Least-squares means ± standard error. Number of heifers measured is given in parentheses. Data from Germ Plasm Evaluation Project (Cycle I, II, and III).

²Data from Germ Plasm Utilization Project and adjusted to 365 days of age.

³Least-squares means ± standard error. Number of bulls measured is given in parentheses.